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January 26, 1996

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JAN 26 1996
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, NW
Washington, DC 20554

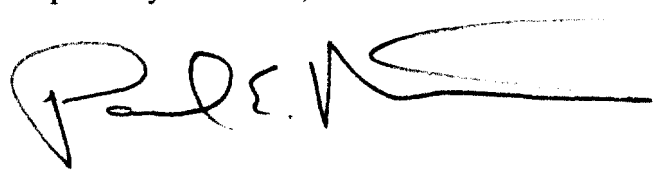
Re: CC Docket No. 92-297
Ex Parte Presentation

Dear Mr. Caton:

Representatives of Texas Instruments, Inc., met yesterday afternoon with Mr. Thomas Tycz of the Commission's International Bureau, Mr. Donald Gips of the Commission's Office of Plans and Policies, and other members of the FCC staff, as well as other participants from industry, on matters related to the pending proceeding in CC Docket No. 92-297. (An attendance list is attached.) Texas Instruments, Inc., was represented by Gene Robinson, Bob Pettit, and Paul Misener. The attached materials formed the basis of discussions.

An original and two copies of this letter are submitted. A copy of this letter, without attachments, is being sent simultaneously to Messrs. Tycz and Gips.

Respectfully submitted,



Paul E. Misener
Counsel for Texas Instruments, Inc.

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Attachments

cc Mr. Thomas Tycz (w/o attachments)
Mr. Donald Gips (w/o attachments)

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Cover

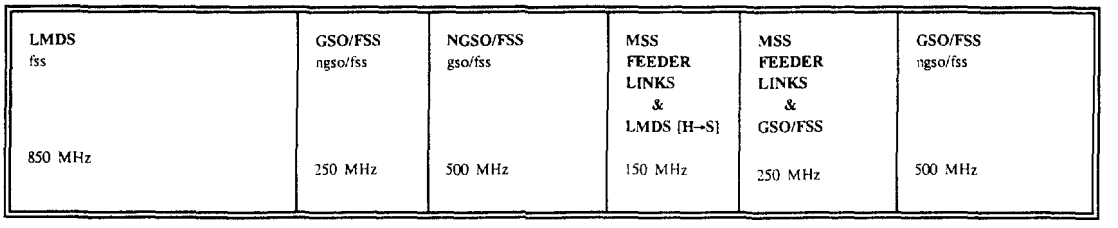
1/25/96

NAME	Organization	Phone	Fax
Jennifer Gilsenan	FCC	418-0757	-0765
Harry NS	FCC	418-2732	-0765
Robert James	FCC	418-0748	-2643
Don Gips	FCC	418-2034	-2087
Thomas S. Tycz	FCC	418-0735	0748
Karl A. Kensinger	FCC	418-0773	-0765
David Wye	FCC	418-0600	-0787
Susan Magnotti	FCC	418-0871	-2643
Jim McCullough	AT&T	908-221-6957	908-221 -4593
Rich Currier	AT+T	908-949-5664	-8082
RICHARD BARNETT	TS FOR LOCKHEED MARTIN	301-229-0204	/320-242
RAY BENDER	DOW, LOWES + Albertson for Lockheed MARTIN	(202) 857-2758	857-2900
PAUL MISENER	WILEY, REIN FOR T.I.	202-828-7506	202-429-7049
Gene Robinson	TI	214-917-6202	214-917-1986
Bob Pettit	Wiley, Rein for TI	429-7019	-7049
JEFF KRAUSS	Consultant / Vision Star	301-309-3703	-9323
CHUCK MILKIS	Law Offices of McCandlish - CV	202-785-2828	-1504
DON BRITTINGHAM	BELL ATLANTIC	202-392-1189	-1687
Tim Campbell	Bell Atlantic	703-351-4631	x4557
ANDREW D'UVA	Willkie Farr for Loral	202-429-4773	887-897
Tom Johnston	Loral	415 852-5454	-5656
Angie Kronenberg	Willkie Farr for Loral	202 429 4726	887-897
ED MILLER	Teledesic	216-234-2868	234-3712
Jennifer A Manner	Akin Gump for Teledesic	202) 857-4576	202) 857-4288
Larry Williams	Teledesic	202.296.8047	-8953
+/-			

		Phone	Fax
MIKE HORSTEIN	TRW	(310) 812-2603	(310) 814-1410
NORM LEVENTHAL	LS+L for TRW	(202) 416-6744	(202) 293-7753
PHILIP MALET	S+S for Motorola	(202) 3716893	(202) 842 3578
David Carroll	Motorola	602 732-4918	202 732-2306
BARRY LAMBERGMAN	MOTOROLA	202-371-6929	842-3578
STEVE GORAN	KASTAR	202/296-2007	202/429-0551
LAURIE NAISMITH	KA STAR	804-599-9470	804/873-4887
Karis Hastings	Hogan & Hartson for GE American	202-637-5767	202-637-5910
BERNARD VECEREK	Hughes Comm	310-607-4585	4415
Roger LeClair	Hughes	(310) 364-8092	(310) 364-7004
YOUNG LEE	ORION	(301) 258-3310	(301) 258-3319
Albert Shuldiner	Vinson & Elkins for NetSat 28	202-639-6722	202-639-6604
Julian Shepard	Verner Liipfert for Orion	(202) 371-6111	202-371-6279
Raul Rey	Hughes Comm	(310) 607-4106	(310) 607-4415
John Jahra	Hughes	202 637 2289	202 637 2201
Jim Justiss	Hughes Comm	(310) 364-4860	(310) 364-4841
Ed Fitzpatrick	Hughes Communications	(310) 364-4840	(310) 364-4841

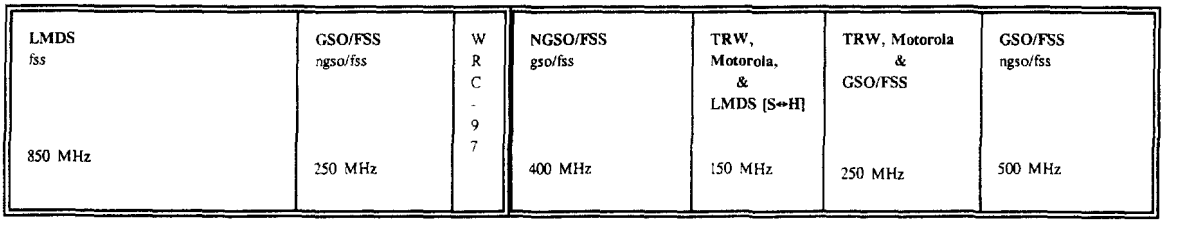
Band Plan Options for the 28 GHz Band

Option 1: Band plan proposed in the Third NPRM.



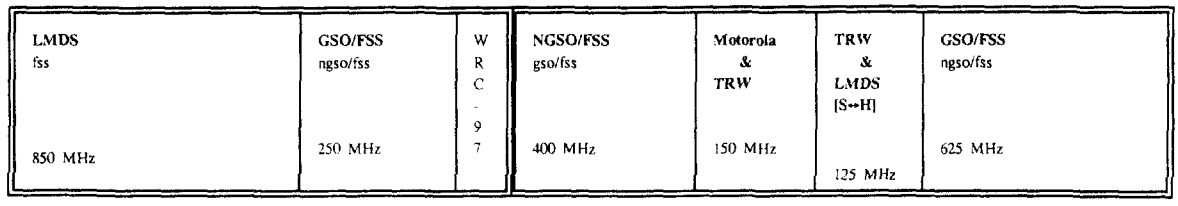
- LMDS subscriber transceivers would not be able to transmit in the band shared with feeder links.
- TRW would operate on a reverse band basis. Sharing criteria necessary between feeder links for the 2 MSS systems at 19 GHz.
- First come first served protection in the 29.25-29.5 band segment.

Option 2: More Extensive Sharing Requirements



- Rules for sharing between Motorola and LMDS so that LMDS can transmit from subscriber to hubs in the shared portion of the bands. (See Attached).
- Rules for sharing between TRW and Motorola i.e., geographical separation of gateway earth stations at distances to be determined by the FCC between approximately 200 and 800 kilometers.
- Rules for sharing between 2 MSS feeder link systems and GSO systems.

Option 3: Staff Band Segmentation Adjustment



- 40 kilometer coordination zone around 2 U.S. TRW sites. In this zone, LMDS accepts interference or undertakes mitigation efforts consistent with TI's proposal for subscriber to hub operations.
- Sharing criteria for Motorola and TRW (Same as Option 2).

Tentative Draft Staff Recommendation

§101. LMDS subscriber transceivers transmitting in the 29.1-29.25 GHz Band

1) LMDS subscriber transceivers operating in the 29.1-29.25 GHz band:

a) shall operate at a peak EIRP per carrier of 12 dBW/MHz in clear air, and shall reduce its EIRP at distances less than the maximum distance from the hub at which a subscriber transceiver is located in accordance with the following formula:

EIRP(dBW/MHz)= 12 dBW/MHz + 20 log d/D

where d = transceiver distance to hub
D = maximum transceiver distance to hub

the peak EIRP derived from this formula may be exceeded in cases where link propagation attenuation exceeds the clear air value and only to the extent that the link is impaired plus a 1 dB margin.

b) shall not exceed the relative peak antenna gain described in Figure X .

See Attached Figure X

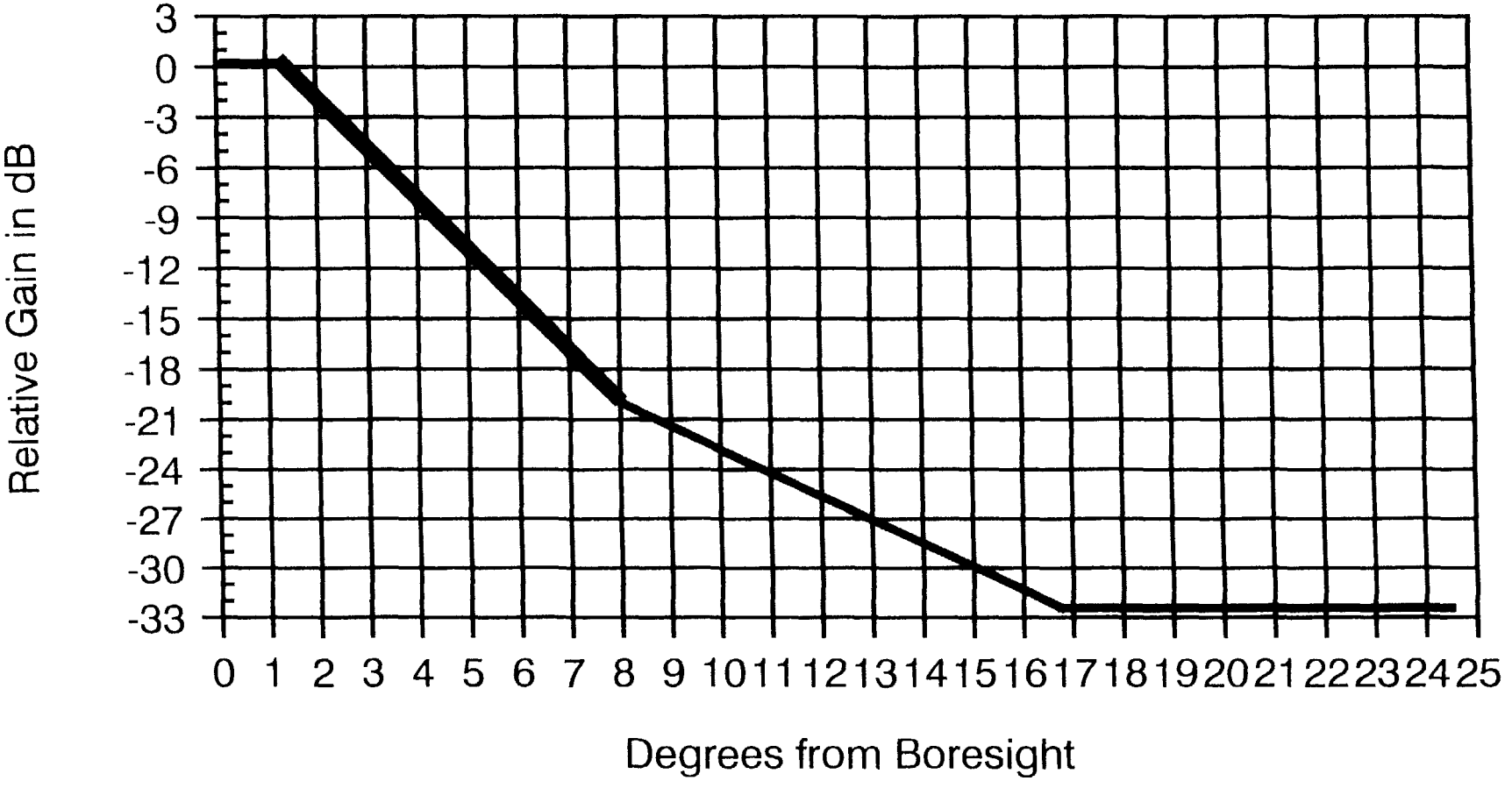
c) each CPE shall automatically inhibit its transmissions if it is not receiving a signalling / communication channel from its associated hub.

LMDS hub stations receiving in the 29.1-29.25 GHz Band:

a) shall be capable of providing automatic power control to LMDS subscriber transceivers to ensure that the EIRP defined in Section X Part (a) is not exceeded by more than 1 dB.

CPE Antenna Mask

Elevation and Azimuth



Summer 95 28 GHz Band Plan Proposal is Unworkable

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25 January 96

- Shares 250 MHz between NGSO MSS feeder links and GSO FSS
- Sharing between these two services has been vigorously studied for over a year
  - No acceptable alternatives have been developed to date
  - All proposed solutions are unacceptable to either one or both of the services
- ITU will study for another two years

A successful spectrum plan requires frequency segmentation between NGSO MSS and GSO FSS

Sharing Methods Considered - No Satisfactory Solution

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Method	Problem
Path diversity (NGSO MSS feeder links)	• Requires change to system design
MEO Orbit avoidance	• Does not solve LEO systems problem • Encumbers 60 % of GSO locations
Exclusion zones	• Precludes GSO service in prime populated areas
Large antennas for FSS earth terminals	• Fundamentally inconsistent with consumer demand • Still requires exclusion zones

Advantages of 25 Jan 96 Proposal

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- Compatible with WRC 95 decisions
- Includes accommodation for potential growth spectrum (100 MHz each) for NGSO MSS feeder links and NGSO FSS
- All proposed services receive their stated band requirements
- Co-frequency sharing is assigned to compatible services (e.g., LMDS and NGSO MSS feeder links)

Enables immediate investment and development of a new class of wireless telecom services for the US market

All Services Compromise

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	Original Request		Proposed Allocation
LMDS	2000	→	1000 MHz
NGSO MSS feeder links	500	→	400 MHz
NGSO FSS	1400	→	500 MHz
GSO FSS	2500	→	1000 MHz

Proposed spectrum allocations are WRC 95 compatible

Summer 95 Band Plan Proposal

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25 January 96

27.5	28.35	28.6	29.1	29.25	29.5	30.0
LMDS	GSO FSS	NGSO FSS	LMDS	GSO FSS	GSO FSS	
fss	ngso fss	gso fss	NGSO MSS FL	NGSO MSS FL	GSO MSS ngso fss	
850	250	500	150	250	500	

- **Shares 250 MHz between NGSO MSS feeder links and GSO FSS**
  - **No acceptable alternatives have been developed to date**
  - **All proposed solutions are unacceptable to either one or both of the services**

25 January 96 Band Plan Proposal

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25 January 96

27.5	28.1	28.6	29.1	29.5	30.0
LMDS	GSO FSS	NGSO FSS	LMDS	GSO FSS	
fss	ngso fss	gso fss	NGSO MSS FL	GSO MSS ngso fss	
600	500	500	400	500	

- Compatible with WRC 95 decisions
- Includes accommodation for potential growth spectrum (100 MHz each) for NGSO MSS feeder links and NGSO FSS
- All proposed services receive their stated band requirements
- Co-frequency sharing is assigned to compatible services (e.g., LMDS and NGSO MSS feeder links)

Band Plan Comparision

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25 January 96

27.5	28.35	28.6	29.1	29.25	29.5	30.0
LMDS	GSO FSS	NGSO FSS	LMDS	GSO FSS	GSO FSS	
fss	ngso fss	gso fss	NGSO MSS FL	NGSO MSS FL	GSO MSS ngso fss	
850	250	500	150	250	500	

Compromise proposal

27.5	28.1	28.6	29.1	29.5	30.0
LMDS	GSO FSS	NGSO FSS	LMDS	GSO FSS	
fss	ngso fss	gso fss	NGSO MSS FL	GSO MSS ngso fss	
600	500	500	400	500	

This proposal represents a pragmatic solution

Uplink Interference at Ka-Band from MSS Feeder Links (Odyssey) into GSO FSS Systems

Dr. Richard Barnett
TELECOMM STRATEGIES for Lockheed Martin
January 25, 1996

Interference Analysis

- Uplink only
- Worst case (no mitigating factors)
- Independent of TRW analysis (simulation software)
- Results relevant to small or large user terminals in the GSO FSS system
- Compares interference against CPM criteria
- Discusses outages versus interference
- Includes comparison with sun outage events
- Concludes sharing is feasible

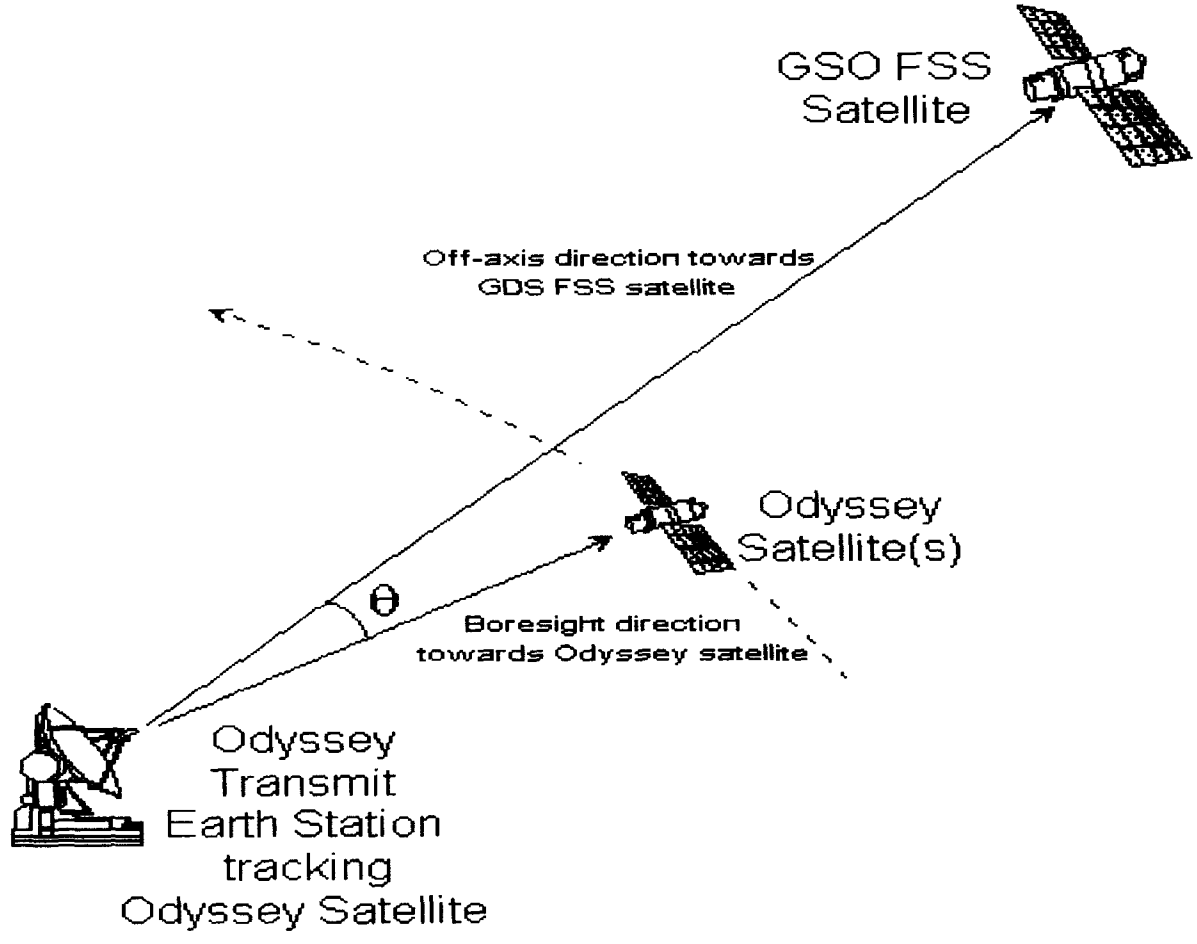
Assumptions (1)

- Worst case:
  - co-frequency (full frequency overlap)
  - co-polar (both operating in LHCP)
  - co-coverage (GSO receive beam peak at Odyssey earth station)
  - fully loaded Odyssey system (peak spectral density - CDMA)
- I_0/N_0 criteria:
  - CPM Report 95/118 (although not an ITU-R Rec.)
- Interferer as defined by TRW:
  - transmit power density (peak) = -55.49 dBW/Hz
  - transmit earth station gain (peak) = +64.8 dBi
  - off-axis gain envelope < 29-25 log(theta) dBi

Assumptions (2)

- GSO satellite receive characteristics:
  - peak antenna gain = 43.4 dBi (approximately 1° diameter)
  - system noise temperature = 600K (i.e., +27.8 dB-K)
  - gives G/T = +15.6 dB/K
- Above beam is compatible with the use of 65 cm user terminals
- Receive antenna beam peak pointing towards Odyssey uplink earth station location

Uplink Interference Geometry



In-Line Interference Analysis

Interfering power density into uplink antenna	-55.49 dBW/Hz
Peak gain of uplink antenna	+64.8 dBi
Peak interfering EIRP spectral density	+9.31 dBW/Hz
Space loss	-213.5 dB
GSO satellite peak gain	+43.4 dB
GSO received interfering power density (I_0)	-160.79 dBW/Hz
GSO satellite noise temperature	+27.8 dBK (600K)
Boltzmann's constant	-228.6 dB
GSO receive noise power density (N_0)	-200.8 dBW/Hz
GSO receive I_0/N_0	+40.01 dB

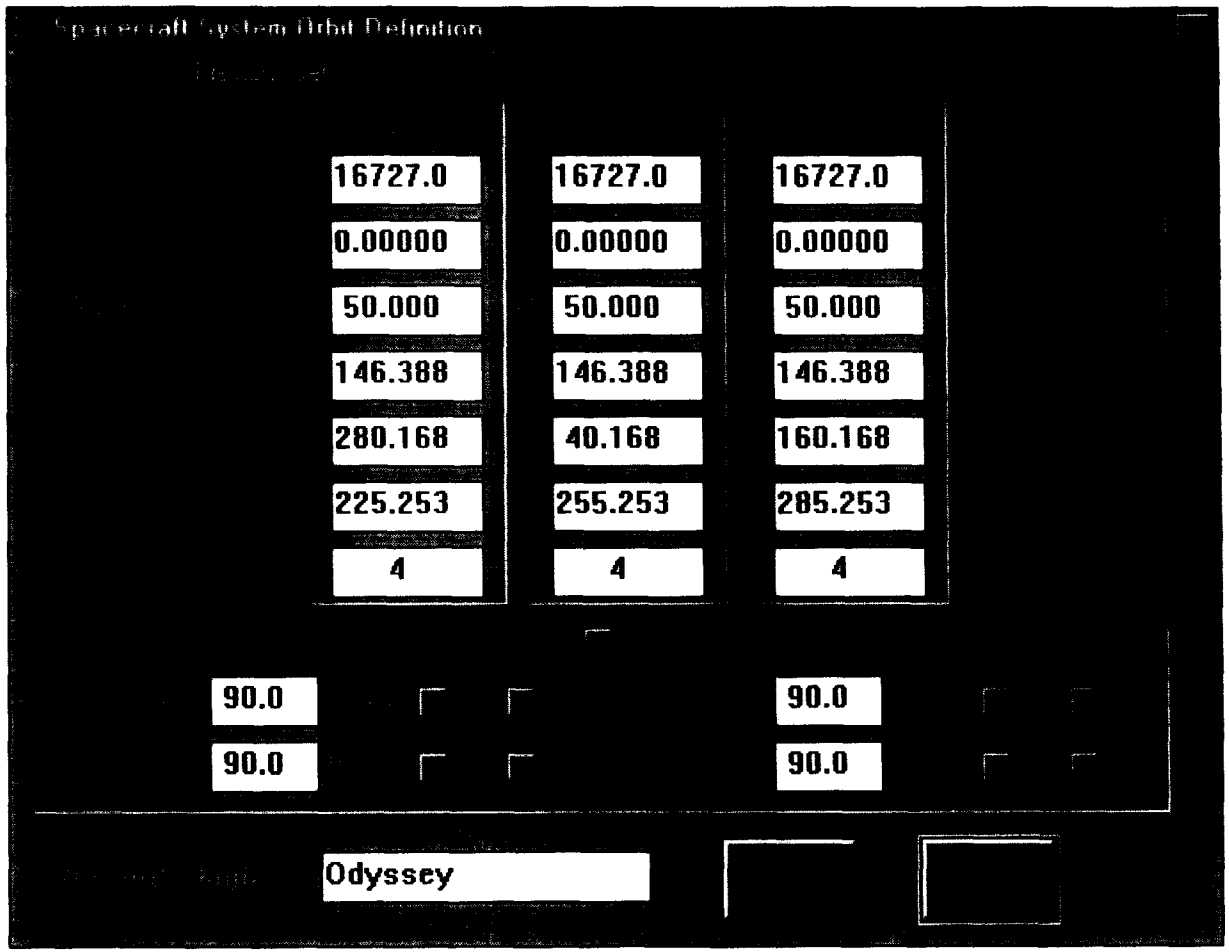
Interference Threshold Off-Axis Angle

CPM criteria (95/118)			Computed isolation requirements for interference threshold	
% time not to be exceeded	I_0/N_0 (linear)	I_0/N_0 (dB)	Off-axis isolation	Off-axis angle $29-25\log(\theta)$
0.87	0.06	-12.22	52.23 dB	4.54°
0.119	0.78	-1.08	41.09 dB	1.63°
0.0294	2.98	+4.74	35.27 dB	0.95°
0.0004	14.8	+11.70	28.31 dB	0.50°

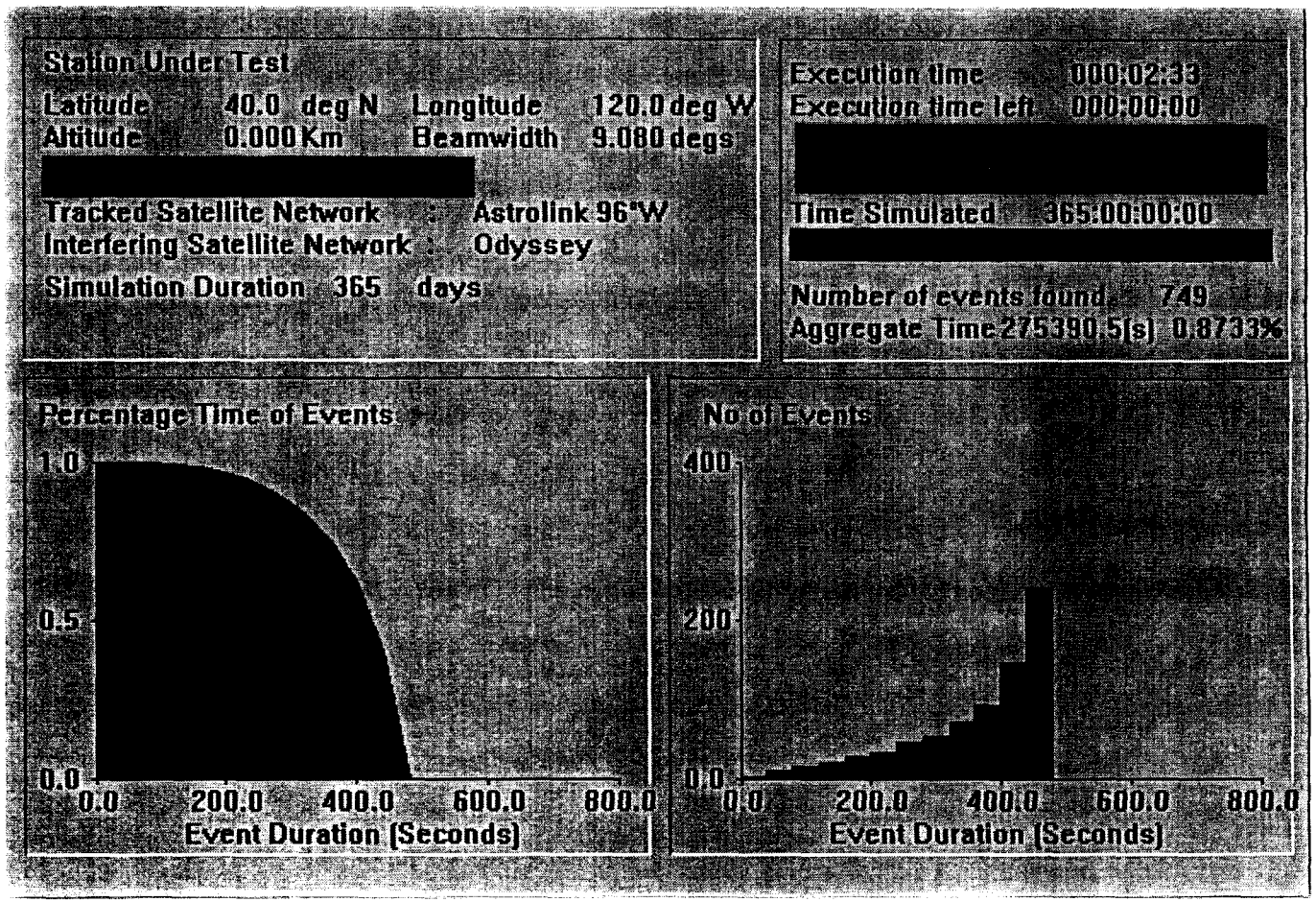
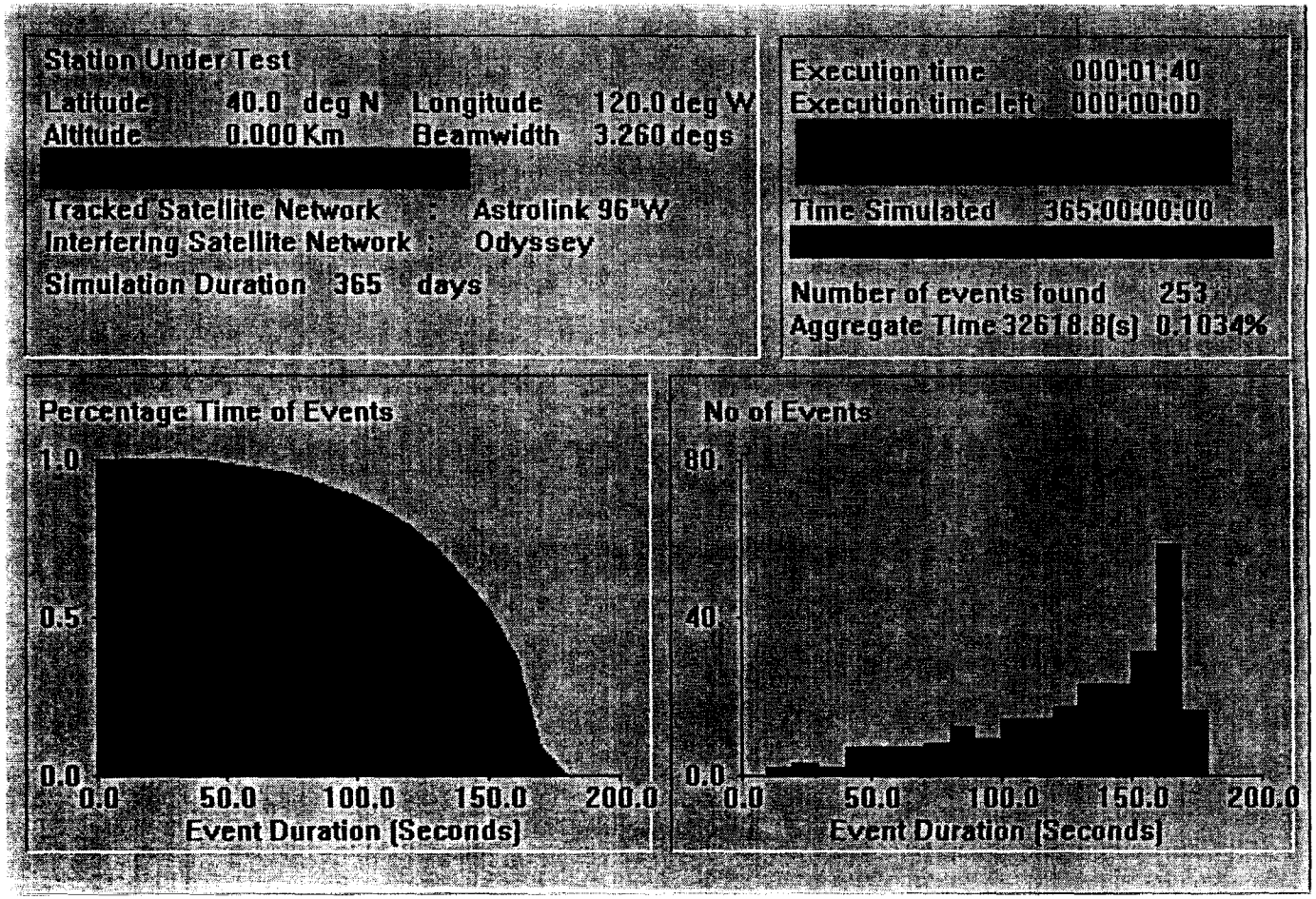
Simulation Software

- Performs time-step simulation of the evolving orbits (NGSO-GSO and NGSO-NGSO)
- Define interference threshold beamwidth (cone angle) of the interfering earth station, and its earth location
- Adaptive algorithm allows long simulated time period with short run-time (365 days in ~2 minutes)
- Counts and aggregates interference events, including duration of each event.
- Provides graphical and numerical output

Odyssey Constellation Definition



Simulation Results ($I_0/N_0 = 0.06$)



Simulation Results ($I_0/N_0 = 0.78$)